

with black spots was found tunneling inside. The sections of the trees containing the borers were taken home to the laboratory, the split portions tied together, and the sticks planted end up in a flower pot of moist sand and covered with a lantern globe cage. The larva continued to feed until reaching maturity, and in due time pupated in the burrow. The insectary being heated, transformations took place much earlier than would be the case normally out of doors, and the adult emerged on February 25, 1911. It proved to be the leopard moth, *Zeuzera pyrina* Linn., and the accompanying illustration, Plate 8, shows the male on the end of the apple tree stem stretching and hardening his wings.

Though the leopard moth has long been known to attack all kinds of deciduous trees, it had not in my experience appeared as a pest of nursery stock. It is causing much damage to shade trees in the cities and towns near the coast, but attacks the smaller branches and twigs especially, often killing them in the tops of large trees. To the best of my knowledge this moth is not found far inland, but since its introduction into this country some thirty or more years ago, it has spread from the vicinity of Hoboken, New Jersey, where it was first noticed, according to Smith's list, north as far as Paterson and south to Eatontown. It has gone eastward and northward along the coast as far as the vicinity of Boston, where it has caused serious damage to shade trees. In Cambridge, Providence and New Haven much injury by it has been reported.

Most writers claim that two years are required for the leopard moth to complete its life cycle, but, though I have not followed the insect through its different stages, I have some evidence indicating one year as the period necessary to produce a generation. We hope to be able to make further observations to settle this point.

There is not much danger of disseminating the species in nursery stock, as the work of the larva is apparent at digging time, and the infested trees are ruined and unsalable.

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## SOME NOTES ON PARANDRA BRUNNEA FABR.

By A. B. GAHAN

United States Bureau of Entomology, Bulletin 94, part 1, treating of damage to chestnut telephone poles by the Cerambycid borer, *Parandra brunnea* Fabr., records the fact that the first instance of serious injury of this nature to come to the notice of entomologists, was that of a case in Maryland which was investigated by the present writer.

The following brief notes are here given regarding the results of that investigation, as adding somewhat to the history of the first discovery of the insect in this relation, rather than as adding anything of much importance to the knowledge of the insect or its work, as contained in the bulletin mentioned.

The Entomological Department of the Maryland Experiment Station obtained its first knowledge of the insect through a letter dated November 30, 1906, from Mr. Clarence Kirwan, Right-of-way Agent of the Chesapeake and Potomac Telephone Company in Baltimore, Md., who stated that it was doing serious damage to the company's poles at Annapolis. He sent also specimens of the larvæ and their work.

Not being able to identify the pest, and hoping to secure further information, the writer went to Annapolis, December 6, and, with the help of the company's agent at that place, dug up the stub of one of the poles which had broken off at the surface of the ground, and beside which a new pole had been set. The stub was of chestnut, and the company's men were of the opinion that it had been treated with some kind of preservative before being placed in the ground, but this was not proven.

That the breaking of the pole had been induced by the work of these insects was evident, since in digging it up, no less than a dozen of the larvæ were uncovered in the partly rotten exterior wood, and examination showed the solid heartwood to be honeycombed with burrows which were tightly packed with castings. The greater number of the larvæ were located within a few inches of the surface of the ground, but several were found to have gone down to a depth of two feet below the surface. Most of the larvæ were in the outer layers of the wood but many had penetrated to a depth of three or four inches. Several other poles were examined and found to be infested, but none so badly as this one. The company's men reported that they had found the same insect in a number of other localities south of Annapolis, where it was causing considerable damage. One instance of unset poles, which had been lying on the ground at the roadside for a period of eighteen months being badly infested, was reported.

The stub of the broken pole was shipped to College Park, and placed in a breeding cage, the bottom of which had been covered with moist sand. Specimens of the larvæ and their work were submitted to Dr. A. D. Hopkins, who stated that he was unable to identify it at that time, further than that it was the larvæ of a *Cerambycid*.

Frequent examinations of the infested poles were made during the spring, summer and fall of 1907, but without finding adult beetles. In November of that year, the pole was cut into and larvæ were found

still feeding and without signs of pupation. During the winter and spring of 1908, the writer was engaged on other work, and compelled to neglect the notes on this borer. However, on July 9, the cage was again examined, and a single female beetle found beneath the pole. July 27 a male was taken from the cage, and another of the same sex, two days later. On August 17, another female was secured. No more adults appearing, the pole was later taken out, and split up, no larvæ or pupæ being found.

While incomplete, these records show that the life cycle of this beetle extends over a period of at least two years, and more likely three years are occupied in its various transformations.

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## LOCOMOTION OF CERTAIN YOUNG SCALE INSECTS

By H. J. QUAYLE

The object of this paper is to present a few experiments on the powers of locomotion of the Black Scale (*Saissetia olea* Bern.), the Red or Orange Scale (*Chrysomphalus aurantii* Mask.) and the Purple Scale (*Lepidosaphes beckii* Newm.). These three scales represent the most important insect enemies of citrus trees in southern California, and the question of how they are spread and what part their own powers of locomotion play in the matter frequently come up for discussion.

The distribution of scale insects over long distances is effected mainly through the interchange of nursery stock, and over the same general community by birds and active insects, chiefly, together with the agency of man in his usual cultural operations, while in the spread from tree to tree or to nearby trees, aside from the above factors, the power of the insects to transport themselves must be taken into consideration. The wind is another factor which may aid certain insects in distributing themselves, either by blowing them directly or with a leaf or light twig upon which they may be resting. Such insects as winged plant lice or the males of scale insects have frequently been observed to be wafted by a gentle breeze or aided in their flight through its influence. Experiments with a foot bellows showed that young black scales are not very readily dislodged from a twig, but once dislodged might be carried a short distance as they fell. Twigs having numerous active young scales had to be brought to within about six inches of the mouth of the bellows before any of the insects were dislodged. It thus requires a stronger wind than